potential (-1.2 Mpa). The results are being evaluated.

Vestra Resources, Inc., an Ames' partner, is developing a hardware, software, and data structure for viewing the VINTAGE model results using a mobile field geographic information system (GIS)-based solution. The portable solution will allow multispectral imagery, VINTAGE model output, and other GIS data layers to be viewed and manipulated under field conditions.

The following individuals and companies collaborated with Ames researchers on this project: R. Nemani and M. White, University of Montana; Robert Mondavi Winery, Oakville, California; Vestra Resources, Inc., Redding, California; Bay Area Shared Information Consortium (BASIC), San Jose, California; Y. Rubin, University of California, Berkeley; S. Hubbard, Lawrence Berkeley Laboratory, Livermore, California.

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ATMOSPHERIC CHEMISTRY AND DYNAMICS BRANCH

Airborne Tracking Sunphotometry

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Sunphotometry is the measurement of the transmission of the solar beam through the atmosphere. Such measurements, made in several narrow bands of ultraviolet, visible, and infrared radiation, provide valuable information on the properties of aerosols and important trace gases such as water vapor and ozone. Atmospheric aerosols (suspensions of particles comprising hazes, smokes, and thin clouds in the troposphere and stratosphere) play important roles in influencing regional and global climates, in determining the chemical composition of the atmosphere, and in modifying transport processes. In all these roles, aerosols interact with trace gases through processes such as evaporation and condensation, photochemical reactions, and mutual interactions with the radiation field. Using a single technique, sunphotometry, to study both aerosols and trace gases is often an advantage in understanding their properties and these interactions.

The objective is to provide unique measurements of aerosols, water vapor, and ozone that address current scientific issues by taking advantage of the three-dimensional mobility of aircraft and other platforms.

Recent advances in understanding climate change, photochemistry, and atmospheric transport and transformation processes have emphasized the need for better knowledge of atmospheric aerosols and their interactions with trace gases. As a result, national and international bodies have called for increased efforts to measure aerosol and trace gas properties and effects, as a means of improving predictions of future climate including greenhouse warming, ozone depletion, and radiation exposure of humans and other organisms.

A fundamental measure of any aerosol or trace gas is how much it attenuates radiation of various wavelengths. This attenuation is often described in terms of the quantity optical depth. The dependence of optical depth on wavelength is the optical depth spectrum. The Ames airborne sunphotometers determine the optical depth spectrum of aerosols and thin clouds, as well as the amounts of water vapor and ozone in the overlying atmospheric column. They do this by pointing detectors at the sun, locking onto the solar beam (i.e., tracking the sun), and measuring the (relative) intensity of the solar beam in several spectral channels. The tracking head of each instrument mounts external to the aircraft cabin, so as to increase data-taking opportunities relative to in-cabin sunphotometers and to avoid data contamination by cabin-window effects.

In FY00, the focus was on improvements of the 6- and 14-channel Ames Airborne Tracking Sunphotometers (AATS-6 and AATS-14), their integration on two aircraft where they had not previously flown, and many flights in two major field campaigns. In particular, AATS-6 was integrated on the Navajo aircraft of the Navy Space and Warfare Center (SPAWAR) and made 21 flights in the Puerto Rico Dust Experiment (PRIDE) in July 2000, and AATS-14 was integrated on the CV-580 of the University of Washington and made 24 flights in the Southern African Regional Science Initiative (SAFARI 2000) in August and September 2000. Analysis of AATS data from PRIDE and SAFARI is now under way. The Ames sunphotometer AATS-6 was used in the October 2000 Water Vapor Intensive Experiment of the Department of Energy Atmospheric Radiation Measurement (DOE-ARM) Program.

Results obtained with AATS-6 and AATS-14 in two previous experiments were also published in FY00. AATS results from the Second Aerosol Characterization Experiment (ACE-2, June-July 1997) were published in a collection of 7 papers in *Tellus*, and results from the Tropospheric Aerosol Radiative Forcing Observational Experiment (TARFOX, July 1996) were published in 6 papers in the second TARFOX special issue of *J. Geophys. Res.*

The AATS-14 data sets are also being used in continuing studies of several techniques for separating aerosol and ozone contributions to solar-beam attenuation. The goal of these studies is to provide insights into aerosol-ozone separation for the Stratospheric Aerosol and Gas Experiment (SAGE II and SAGE III) spaceborne sensors, particularly when their measurements extend downward from the stratosphere into the troposphere. Also, project personnel combined SAGE II measurements with those by the Cryogenic Limb Array Etalon Spectrometer (CLAES) to develop maps and histories of stratospheric aerosol properties before and after the Pinatubo volcanic injection to the stratosphere.

The Ames investigators on this project collaborated with the following academic and research institutions: NASA Goddard Space Flight Center and NASA Langley Research Center; National Oceanic and Atmospheric Administration; Lawrence Berkeley National Laboratory; University of Washington; California Institute of Technology; University of California at Los Angeles; State University of New York; Naval Postgraduate School; University of Miami; San Jose State University; Stockholm University; United Kingdom Meteorological Research Flight; Max Planck Institute of Chemistry, Germany; University of Science and Technology of Lille, France; and TNO Physics and Electronics Laboratory, Netherlands.

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